AMENDMENTS TO THE CLAIMS

1. (Currently Amended) Method of determining the velocity v and anellipticity η parameters for processing seismic traces obtained from seismic receivers in a common midpoint (CMP) gather including an anelliptic (Normal Move Out) NMO correction, comprising:

a preliminary step to define a plurality of nodes (dtn, τ_0) in a CMP gather of a series of seismic traces, at least a portion of said traces corresponding to signals reflected by geological interfaces of a subsurface zone, ~~the~~ said nodes being indicative of parameters dtn and τ_0, wherein dtn represent ~~representing~~ the NMO correction for the maximum offset and τ_0 represent the zero offset travel time in hyperbolic coordinates, ~~the~~ said preliminary step being followed by

for each node (dtn, τ_0) defined in the preliminary step, the following steps:

~~for~~ performing static NMO correction of traces in the CMP gather as a function of the values of the said parameters dtn, τ_0 at the node considered, and

~~for~~ calculating the semblance function associated with the said NMO correction for the node considered; and

for each picked time t_0, ~~a step including determination of~~ determining the maximum semblance node (dtn (t_0), τ_0 (t_0)),

a step to convert the dtn (t_0) and τ_0 (t_0) parameters so as to obtain the velocity V (t_0) and ~~anellepticity~~ anellipticity η (t_0) laws

and a step of processing the seismic traces in view of the obtained velocity V (t_0) and ~~anellepticity~~ anellipticity η (t_0) laws, the output of said processing used to represent the seismic traces in one or more images of at least a portion of the geological interfaces of said subsurface zone.

2. (Original) Method according to claim 1, wherein the nodes are defined during the preliminary step in an analysis volume (dtn, τ_0,t_0) determined by minimum and maximum values respectively [dtn_{min}, dtn_{max}] [τ_{0min}, τ_{0max}] and [t_{0min}, t_{0max}] of the dtn, τ_0, t_0 parameters.

3. (Original) Method according to claim 2, wherein, during the preliminary step, a corridor $[dtn_{min}(t_0), dtn_{max}(t_0)]$, $[\tau_{0min}(t_0), \tau_{0max}(t_0)]$ for changing dtn and τ_0 parameters is delimited inside the analysis volume as a function of plausible velocity V and anellipticity η values, the nodes (dtn, τ_0) defined for applying the NMO correction being then located along the corridor thus delimited.

4. (Previously Presented) Method according to claim 1, further comprising, for each node (dtn, τ_0), a stacking step of the corrected seismic traces, following the semblance function calculation step.

5. (Original) Method according to claim 4, wherein the stacking of corrected traces is done using only near offset traces.

6. (Previously Presented) Method according to claim 4, further comprising for each picked time, and following the step for determining the maximum semblance node, a step of checking that values dtn and τ_0 of the maximum semblance node correspond to a stacking extreme value for the same values dtn and τ_0.

7. (Previously Presented) Method according to claim 1, further comprising a step of selecting and adjusting the pickings obtained, following the step implemented for determining the maximum semblance node $(dtn(t_0), \tau_0(t_0))$ for each picked time t_0, before the conversion step.

8. (Original) Method according to claim 7, wherein the said step of selecting and adjusting the pickings comprises a step of only retaining pickings dtn and τ_0 for which time to the highest semblance pickings is greater than a predefined value.

9. (Original) Method according to claim 8, wherein the said step of selecting and adjusting the pickings also comprises a step for adjusting the retained pickings dtn and τ_0 by parabolic interpolations using values about the said picked values.

10. (Original) Method according to claim 9, wherein the said step of selecting and adjusting pickings also comprises a step of eliminating retained and adjusted pickings dtn and τ_0 when it is impossible to calculate the Dix interval velocities between the picking considered and higher semblance pickings.

11. (Previously Presented) Method according to claim 1, wherein the processing applied to seismic traces is an NMO correction process implementing a static correction $CORR_{NMO}$.

12. (Original) Method according to claim 11, wherein, during the preliminary step, the NMO corrections $CORR_{NMO}$ are calculated for all nodes (dtn, τ_0) including in the analysis volume and all offsets of processed seismic traces.

13. (Original) Method according to claim 12, wherein the NMO correction carried out for each node (dtn, τ_0), consists of applying NMO corrections $CORR_{NMO}$ calculated during the preliminary step.

14. (Previously Presented) Method according to claim 11, wherein for a given (dtn, τ_0) pair, the static NMO correction $CORR_{NMO}$ of a seismic trace with offset x is carried out according to the following equation:

$$CORR_{NMO}(x) = -\tau_0 + \sqrt{\tau_0^2 + \frac{dtn(dtn + 2\tau_0)}{x_{max}^2} x^2}$$

in which X_{max} represents the maximum offset in the CMP gather.

15. (Withdrawn) Method according to claim 1, wherein the processing applied to seismic traces is a PSTM migration using a static NMO correction $CORR_{PSTM}$.

16 (Withdrawn) Method according to claim 15, wherein, during the preliminary step, the NMO corrections $CORR_{PSTM}$ are calculated for all nodes (dtn and τ_0) included in the analysis volume and all migration offsets inside the migration aperture.

17. (Withdrawn): Method according to claim 16, wherein the NMO correction step carried out for each node (dtn and τ_0) comprises, for each offset class, application of the said NMO corrections $CORR_{PSTM}$, calculated during the preliminary step on all midpoints inside the migration aperture.

18. (Withdrawn) Method according to claim 17, wherein the NMO correction step carried out for each node (dtn and τ_0) comprises, for each offset class, the stack of the corrected midpoints following application of the said NMO corrections $CORR_{PSTM}$.

19 (Withdrawn) Method according to claim 15, wherein, for a given pair (dtn and τ_0), the static NMO correction $CORR_{PSTM}$ is carried out according to the following equation:

$$CORR_{PSTM}(x) = -\tau_0 + \sqrt{\frac{\tau_0^2}{4} + \frac{dtn(dtn + 2\tau_0)(x - x + h)^2}{x_{\max}^2}} + \sqrt{\frac{\tau_0^2}{4} + \frac{dtn(dtn + 2\tau_0)(x - x + h)^2}{x_{\max}^2}}$$

where:

x_m represents the coordinates of the midpoints,

$x - x_m$ represents the migration aperture PSTM,

h is the half source – receiver offset,

x_{max} is the maximum offset and aperture of the migration.

20. (Previously Presented) Method according to claim 14, wherein, during the final conversion step, the parameters dtn (t_0) and (τ_0) are converted to the velocity law v (t_0) according to the following equation:

$$V = \frac{x_{\max}}{\sqrt{dtn(dtn + 2\tau_0)\frac{t_0}{\tau_0}}}$$

21. (Currently Amended): Method according to claim 14, wherein, during the final conversion step, the parameter τ_0 (t_0) is converted to the ~~anellepticity~~ anellipticity η (t_0) law according to

$$\eta = \frac{1}{8}\left(\frac{t_0}{\tau_0} - 1\right)$$

22. (Currently Amended) Method according to claim 20, wherein parameter dtn is defined with respect to the velocity v and ~~anellepticity~~ anellipticity η according to the following equation:

$$dtn = \frac{8\eta}{1+8\eta} t_0 + \sqrt{\left(\frac{t_0}{1+8\eta}\right)^2 + \frac{x_{\max}^2}{(1+8\eta)V^2}}$$

23. (Currently Amended) Method according to claim 21, wherein parameter τ_0 is defined according to ~~anellepticity~~ anellipticity η according to the following equation:

$$\tau_0 = \frac{t_0}{1+8\eta}$$

24. (Withdrawn) Method of characterizing a velocity field for processing seismic data using a gather of seismic traces at common midpoint, wherein, for each travel time t_0 for a zero offset, a set of parameters dtn and t_0 is defined, representing the NMO correction for maximum offset, and the zero offset travel time respectively, in hyperbolic coordinates.

25. (Original) Method according to claim 2, further comprising, for each node (dtn, τ_0), a stacking step of the corrected seismic traces, following the semblance function calculation step.

26. (Original) Method according to claim 25, wherein the stacking of corrected traces is done using only near offset traces.

27. (Original) Method according to claim 25, further comprising for each picked time, and following the step for determining the maximum semblance node, a step of checking that values dtn and τ_0 of the maximum semblance node correspond to a stacking extreme value for the same values dtn and τ_0.

28. (Original) Method according to claim 2, further comprising a step of selecting and adjusting the pickings obtained, following the step implemented for determining the maximum semblance node (dtn (t_0), τ_0 (t_0)) for each picked time t_0, before the conversion step.

29 (Original) Method according to claim 28, wherein the said step of selecting and adjusting the pickings comprises a step of only retaining pickings dtn and τ_0 for which time to the highest semblance pickings is greater than a predefined value.

30. (Original) Method according to claim 29, wherein the said step of selecting and adjusting the pickings also comprises a step for adjusting the retained pickings dtn and τ_0, by parabolic interpolations using values about the said picked values.

31. (Original) Method according to claim 30, wherein the said step of selecting and adjusting pickings also comprises a step of eliminating retained and adjusted pickings dtn and τ_0 when it is impossible to calculate the Dix interval velocities between the picking considered and higher semblance pickings.

32. (Original) Method according to claim 2, wherein the processing applied to seismic traces is an NMO correction process implementing a static correction $CORR_{NMO}$.

33. (Original) Method according to claim 32, wherein, during the preliminary step, the NMO corrections $CORR_{NMO}$ are calculated for all nodes (dtn, τ_0) including in the analysis volume and all offsets of processed seismic traces.

34. (Original) Method according to claim 32, wherein the NMO correction carried out for each node (dtn, $\tau_{0)}$ consists of applying NMO corrections $CORR_{NMO}$. calculated during the preliminary step.

35. (Original) Method according to claim 32, wherein for a given (dtn, τ_0) pair, the static NMO correction $CORR_{NMO}$ of a seismic trace with offset x is carried out according to the following equation:

$$CORR_{NMO}(x) = -\tau_0 + \sqrt{\tau_0^2 + \frac{dtn(dtn + 2\tau_0)}{x_{\max}^2}x^2}$$

in which X_{max} represents the maximum offset in the CMP gather.

36. (Withdrawn) Method according to claim 2, wherein the processing applied to seismic traces is a PSTM migration using a static NMO correction $CORR_{PSTM}$.

37. (Withdrawn) Method according to claim 36, wherein, during the preliminary step, the NMO corrections $CORR_{PSTM}$ are calculated for all nodes (dtn and τ_0) included in the analysis volume and all migration offsets inside the migration aperture.

38. (Withdrawn) Method according to claim 37, wherein the NMO correction step carried out for each node (dtn and τ_0) comprises, for each offset class, application of the said NMO corrections $CORR_{PSTM}$, calculated during the preliminary step on all midpoints inside the migration aperture.

39. (Withdrawn) Method according to claim 38, wherein the NMO correction step carried out for each node (dtn and τ_0) comprises, for each offset class, the stack of the corrected midpoints following application of the said NMO corrections $CORR_{PSTM}$.

40. (Previously Presented) Method according to claim 2, wherein the processing applied to seismic traces is a PSTM migration using a static NMO correction $CORR_{PSTM}$, and wherein, for a given pair (dtn and τ_0), the static NMO correction $CORR_{PSTM}$ is carried out according to the following equation:

$$CORR_{PSTM}(x) = -\tau_0 + \sqrt{\frac{\tau_0^2}{4} + \frac{dtn(dtn + 2\tau_0)(x - x + h)^2}{x_{max}^2}} + \sqrt{\frac{\tau_0^2}{4} + \frac{dtn(dtn + 2\tau_0)(x - x + h)^2}{x_{max}^2}}$$

where:

x_m represents the coordinates of the midpoints,

$x - x_m$ represents the migration aperture PSTM,

h is the half source – receiver offset,

x_{max} is the maximum offset and aperture of the migration.

41. (Original) Method according to claim 35, wherein, during the final conversion step, the parameters dtn (t_0) and (τ_0) are converted to the velocity law v (t_0) according to the following equation:

$$V = \frac{x_{max}}{\sqrt{dtn(dtn + 2\tau_0)\frac{t_0}{\tau_0}}}$$

42. (Currently Amended) Method according to claim 35, wherein, during the final conversion step, the parameter τ_0 (t_0) is converted to the ~~anellepticity~~ anellipticity η (t_0) law according to

$$\eta = \frac{1}{8}\left(\frac{t_0}{\tau_0} - 1\right)$$

43. (Currently Amended) Method according to claim 41, wherein parameter dtn is defined with respect to the velocity v and ~~anellepticity~~ anellipticity η according to the following equation:

$$dtn = \frac{8\eta}{1+8\eta} t_0 + \sqrt{\left(\frac{t_0}{1+8\eta}\right)^2 + \frac{x_{\max}^2}{(1+8\eta)V^2}}$$

44. (Currently Amended) Method according to claim 42, wherein parameter τ_0 is defined according to ~~anellepticity~~ anellipticity η according to the following equation:

$$\tau_0 = \frac{t_0}{1+8\eta}$$

45. (Original): Method according to claim 3, further comprising, for each node (dtn, τ_0), a stacking step of the corrected seismic traces, following the semblance function calculation step.

46. (Original) Method according to claim 45, wherein the stacking of corrected traces is done using only near offset traces.

47. (Original) Method according to claim 45, further comprising for each picked time, and following the step for determining the maximum semblance node, a step of checking that values dtn and τ_0; of the maximum semblance node correspond to a stacking extreme value for the same values dtn and τ_0.

48. (Original) Method according to claim 3, further comprising a step of selecting and adjusting the pickings obtained, following the step implemented for determining the maximum semblance node (dtn (t_0), τ_0 (t_0)) for each picked time t_0, before the conversion step.

49. (Original) Method according to claim 48, wherein the said step of selecting and adjusting the pickings comprises a step of only retaining pickings dtn and τ_0 for which time to the highest semblance pickings is greater than a predefined value.

50. (Original) Method according to claim 49, wherein the said step of selecting and adjusting the pickings also comprises a step for adjusting the retained pickings dtn and τ_0 by parabolic interpolations using values about the said picked values.

51. (Original) Method according to claim 50, wherein the said step of selecting and adjusting pickings also comprises a step of eliminating retained and adjusted pickings dtn and τ_0 when it is impossible to calculate the Dix interval velocities between the picking considered and higher semblance pickings.